

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (withdrawn): A system for evaluating cardiac performance relative
2 to performance of an intrathoracic pressure maneuver, comprising:
3 an implantable medical device to indirectly sense blood pressure by
4 directly collecting intracardiac impedance measures; and
5 an analysis component to evaluate cardiac functional changes to the blood
6 pressure in response to performance of an intrathoracic pressure maneuver.
- 1 2. (withdrawn): A system according to Claim 1, wherein the blood
2 pressure comprises at least one of arterial pressure, cardiac chamber pressure,
3 systolic pressure, and diastolic pressure.
- 1 3. (withdrawn): A system according to Claim 2, wherein the cardiac
2 chamber pressure comprises left ventricular end diastolic pressure.
- 1 4. (withdrawn): A system according to Claim 1, wherein the
2 implantable medical device comprises at least one of a bradycardia, tachycardia,
3 heart failure, therapy delivery, and monitoring device.
- 1 5. (withdrawn): A system according to Claim 1, further comprising:
2 at least one lead to couple to the implantable medical device and to sense
3 at least one of the intracardiac impedance measures across the thoracic cavity and
4 the intracardiac impedance measures across the heart.
- 1 6. (withdrawn): A system according to Claim 1, wherein the
2 intrathoracic pressure maneuver comprises at least one of a Valsalva and Müller
3 maneuver.

1 7. (withdrawn): A system according to Claim 1, further comprising:
2 an evaluation subcomponent to evaluate at least one of overdamping and
3 underdamping cardiac impedance response relative to normative levels.

1 8. (withdrawn): A system according to Claim 7, further comprising:
2 a notification subcomponent to generate a notification responsive to the at
3 least one of overdamping and underdamping cardiac impedance response.

1 9. (withdrawn): A system according to Claim 1, wherein thoracic
2 pressure is monitored during the intrathoracic pressure maneuver.

1 10. (withdrawn): A system according to Claim 9, further comprising:
2 an external pressure monitor to define a confined volume configured to
3 receive a forced exhalation and to measure the thoracic pressure relative to the
4 confined volume.

1 11. (withdrawn): A system according to Claim 9, further comprising:
2 a thoracic pressure sensor to internally measure thoracic pressure.

1 12. (withdrawn): A method for evaluating cardiac performance relative
2 to performance of an intrathoracic pressure maneuver, comprising:
3 indirectly sensing blood pressure by directly collecting intracardiac
4 impedance measures through an implantable medical device; and
5 evaluating cardiac functional changes to the blood pressure in response to
6 performance of an intrathoracic pressure maneuver.

1 13. (withdrawn): A method according to Claim 12, wherein the blood
2 pressure comprises at least one of arterial pressure, cardiac chamber pressure,
3 systolic pressure, and diastolic pressure.

1 14. (withdrawn): A method according to Claim 13, wherein the cardiac
2 chamber pressure comprises left ventricular end diastolic pressure.

- 1 15. (withdrawn): A method according to Claim 12, wherein the
2 implantable medical device comprises at least one of a bradycardia, tachycardia,
3 heart failure, therapy delivery, and monitoring device.
- 1 16. (withdrawn): A method according to Claim 12, further comprising:
2 sensing at least one of the intracardiac impedance measures across the
3 thoracic cavity and the intracardiac impedance measures across the heart.
- 1 17. (withdrawn): A method according to Claim 12, wherein the
2 intrathoracic pressure maneuver comprises at least one of a Valsalva and Müller
3 maneuver.
- 1 18. (withdrawn): A method according to Claim 12, further comprising:
2 evaluating at least one of overdamping and underdamping cardiac
3 impedance response relative to normative levels.
- 1 19. (withdrawn): A method according to Claim 18, further comprising:
2 generating a notification responsive to the at least one of overdamping and
3 underdamping cardiac impedance response.
- 1 20. (withdrawn): A method according to Claim 12, further comprising:
2 monitoring thoracic pressure during the intrathoracic pressure maneuver.
- 1 21. (withdrawn): A method according to Claim 20, further comprising:
2 defining a confined volume configured to receive a forced exhalation; and
3 measuring the thoracic pressure relative to the confined volume.
- 1 22. (withdrawn): A method according to Claim 20, further comprising:
2 internally measuring thoracic pressure.
- 1 23. (withdrawn): An apparatus for evaluating cardiac performance
2 relative to performance of an intrathoracic pressure maneuver, comprising:

3 means for indirectly sensing blood pressure by directly collecting
4 intracardiac impedance measures through an implantable medical device; and
5 means for evaluating cardiac functional changes to the blood pressure in
6 response to performance of an intrathoracic pressure maneuver.

1 24. (currently amended): A system for assessing cardiac performance
2 through transcardiac impedance monitoring, comprising:
3 an implantable medical device to directly collect intracardiac impedance
4 measures;
5 a correlation component to correlate the intracardiac impedance measures
6 to cardiac ~~dimensional~~ pressure measures relative to performance of an
7 intrathoracic pressure maneuver and to group the cardiac ~~dimensional~~ pressure
8 measures into at least one measures set corresponding to a temporal phase of the
9 intrathoracic pressure maneuver; and
10 an analysis component to evaluate the at least one cardiac ~~dimensional~~
11 pressure measures set against a cardiac ~~dimensional~~ pressure trend for the
12 corresponding intrathoracic pressure maneuver temporal phase to represent
13 cardiac performance.

1 25. (currently amended): A system according to Claim 24, wherein the
2 cardiac ~~dimensional~~ pressure measures comprise at least one of cardiac stroke
3 volume, left ventricular ejection fraction, left ventricular end diastolic ~~dimension~~,
4 pressure, and left ventricular end systolic ~~dimension~~ pressure.

1 26. (original): A system according to Claim 24, further comprising:
2 a history subcomponent to evaluate a history of cardiac performance
3 representations; and
4 a trending subcomponent to recognize a trend within the history indicating
5 at least one of cardiovascular disease absence, onset, progression, regression, and
6 status quo.

1 27. (currently amended): A system according to Claim 24, further
2 comprising:
3 a characteristic signature formed with the cardiac ~~dimensional~~ pressure
4 trends over the performance of the intrathoracic pressure maneuver; and
5 a comparison subcomponent to compare an overall cardiac ~~dimensional~~
6 pressure profile comprising the at least one cardiac ~~dimensional~~ pressure
7 measures set to the characteristic signature to form a cardiac performance
8 assessment.

1 28. (original): A system according to Claim 27, further comprising:
2 a predefined threshold with the comparison module to analyze the cardiac
3 performance assessment relative to the predefined threshold.

1 29. (original): A system according to Claim 28, further comprising:
2 a notification generated responsive to the cardiac performance assessment
3 substantially non-complying to the predefined threshold.

1 30. (original): A system according to Claim 24, wherein the
2 intrathoracic pressure maneuver comprises the Valsalva maneuver, further
3 comprising:
4 a collection subcomponent to collect the intracardiac impedance measures
5 relative to performance of the Valsalva maneuver.

1 31. (original): A system according to Claim 30, further comprising:
2 a phase subcomponent to specify four phases physiologically
3 corresponding to the performance of the Valsalva maneuver, comprising defining
4 Phase I corresponding to initial strain, defining Phase II corresponding to strain
5 duration and cessation of breathing, defining Phase III corresponding to strain
6 discontinuation and resumption of normal breathing, and defining Phase IV
7 corresponding to recovery.

1 32. (currently amended): A system according to Claim 31, further
2 comprising:
3 a trending subcomponent to identify an overshoot of the cardiac
4 ~~dimensional~~ pressure during the Phase IV.

1 33. (currently amended): A system according to Claim 32, wherein the
2 trending subcomponent further comprises identifying an increase of the cardiac
3 ~~dimensional~~ pressure during the Phase I, identifying a transient decrease of the
4 cardiac ~~dimensional~~ pressure during the Phase II, identifying a sharp decrease of
5 the cardiac ~~dimensional~~ pressure during the Phase III, and identifying an increase
6 preceding the overshoot and a decrease of the cardiac ~~dimensional~~ pressure during
7 the Phase IV.

1 34. (original): A system according to Claim 24, further comprising:
2 a programming subcomponent to provide programming support to the
3 implantable medical device.

1 35. (original): A system according to Claim 24, wherein the
2 implantable medical device comprises at least one of an implantable cardiac
3 pacemaker, implantable cardioverter defibrillator, implantable cardiac
4 resynchronization device, implantable cardiovascular monitor, and therapeutic
5 device monitoring and treating structural problems of the heart.

1 36. (original): A system according to Claim 24, further comprising:
2 a database to maintain the intracardiac impedance measures.

1 37. (original): A system according to Claim 24, wherein the
2 intrathoracic pressure maneuver comprises at least one of the Valsalva maneuver
3 and Müller maneuver.

1 38. (currently amended): A method for assessing cardiac performance
2 through transcardiac impedance monitoring, comprising:

3 directly collecting intracardiac impedance measures through an
4 implantable medical device;
5 correlating the intracardiac impedance measures to cardiac ~~dimensional~~
6 pressure measures relative to performance of an intrathoracic pressure maneuver;
7 grouping the cardiac ~~dimensional~~ pressure measures into at least one
8 measures set corresponding to a temporal phase of the intrathoracic pressure
9 maneuver; and
10 evaluating the at least one cardiac ~~dimensional~~ pressure measures set
11 against a cardiac ~~dimensional~~ pressure trend for the corresponding intrathoracic
12 pressure maneuver temporal phase to represent cardiac performance.

1 39. (currently amended): A method according to Claim 38, wherein the
2 cardiac ~~dimensional~~ pressure measures comprise at least one of cardiac stroke
3 volume, left ventricular ejection fraction, left ventricular end diastolic ~~dimension~~,
4 pressure, and left ventricular end systolic ~~dimension~~. pressure.

1 40. (original): A method according to Claim 38, further comprising:
2 evaluating a history of cardiac performance representations; and
3 recognizing a trend within the history indicating at least one of
4 cardiovascular disease absence, onset, progression, regression, and status quo.

1 41. (currently amended): A method according to Claim 38, further
2 comprising:
3 forming a characteristic signature with the cardiac ~~dimensional~~ pressure
4 trends over the performance of the intrathoracic pressure maneuver; and
5 comparing an overall cardiac ~~dimensional~~ pressure profile comprising the
6 at least one cardiac ~~dimensional~~ pressure measures set to the characteristic
7 signature to form a cardiac performance assessment.

1 42. (original): A method according to Claim 41, further comprising:
2 analyzing the cardiac performance assessment relative to a predefined
3 threshold.

1 43. (original): A method according to Claim 42, further comprising:
2 generating a notification responsive to the cardiac performance assessment
3 substantially non-complying to the predefined threshold.

1 44. (original): A method according to Claim 38, wherein the
2 intrathoracic pressure maneuver comprises the Valsalva maneuver, further
3 comprising:
4 collecting the intracardiac impedance measures relative to performance of
5 the Valsalva maneuver.

1 45. (original): A method according to Claim 44, further comprising:
2 specifying four phases physiologically corresponding to the performance
3 of the Valsalva maneuver, comprising:
4 defining Phase I corresponding to initial strain;
5 defining Phase II corresponding to strain duration and cessation of
6 breathing;
7 defining Phase III corresponding to strain discontinuation and
8 resumption of normal breathing; and
9 defining Phase IV corresponding to recovery.

1 46. (currently amended): A method according to Claim 45, further
2 comprising:
3 identifying an overshoot of the cardiac ~~dimensional~~ pressure during the
4 Phase IV.

1 47. (currently amended): A method according to Claim 46, further
2 comprising:
3 identifying an increase of the cardiac ~~dimensional~~ pressure during the
4 Phase I;
5 identifying a transient decrease of the cardiac ~~dimensional~~ pressure during
6 the Phase II;

7 identifying a sharp decrease of the cardiac ~~dimensional~~ pressure during the
8 Phase III; and
9 identifying an increase preceding the overshoot and a decrease of the
10 cardiac ~~dimensional~~ pressure during the Phase IV.

1 48. (original): A method according to Claim 38, further comprising:
2 providing programming support to the implantable medical device.

1 49. (original): A method according to Claim 38, wherein the
2 implantable medical device comprises at least one of an implantable cardiac
3 pacemaker, implantable cardioverter defibrillator, implantable cardiac
4 resynchronization device, implantable cardiovascular monitor, and therapeutic
5 device monitoring and treating structural problems of the heart.

1 50. (original): A method according to Claim 38, further comprising:
2 maintaining the intracardiac impedance measures in a database.

1 51. (original): A method according to Claim 38, wherein the
2 intrathoracic pressure maneuver comprises at least one of the Valsalva maneuver
3 and Müller maneuver.

1 52. (currently amended): An apparatus for assessing cardiac
2 performance through transcardiac impedance monitoring, comprising:
3 means for directly collecting intracardiac impedance measures through an
4 implantable medical device;
5 means for correlating the intracardiac impedance measures to cardiac
6 ~~dimensional~~ pressure measures relative to performance of an intrathoracic
7 pressure maneuver;
8 means for grouping the cardiac ~~dimensional~~ pressure measures into at least
9 one measures set corresponding to a temporal phase of the intrathoracic pressure
10 maneuver; and

- 11 means for evaluating the at least one cardiac ~~dimensional~~ pressure
- 12 measures set against a cardiac ~~dimensional~~ pressure trend for the corresponding
- 13 intrathoracic pressure maneuver temporal phase to represent cardiac performance.